

Technology Innovation Project



Project Brief

TIP 282: Transmission Power Flow Controls for Bulk Grid Optimization

Context

The project will test the hypotheses that a well planned transmission upgrade that adds power flow control to the main grid can increase operating transfer capability (OTC) and total transfer capability (TTC), while maintaining or increasing reliability and operating flexibility. The power flow control alternative will also need to provide a superior cost/benefit ratio than a new line build addressing the same constraints.

Integration of variable energy resources, main grid transfer limits due to parallel flow on lower rated facilities, increasing difficulty in scheduling operation and maintenance outages, and difficulty in adding new transmission lines due to significant lead time, capital investment, and public opposition are all challenges that motivate the desire for studying network power flow control solutions. An increase in the level of power flow controls has the potential to improve transmission system performance for more diverse and varying generation patterns, system conditions, and increased transfers. This project will investigate power flow control solutions to more clearly understand the opportunities that exist.

Description

This project studies transmission level power flow control solutions for the following issues:

- Main grid transfer congestion on important Northwest flow gates
- Potential for increased power exports from the Pacific Northwest
- A review of the ability for power flow solutions to optimize of the existing grid by:
 - Minimizing real power losses
 - Maximizing load service and reliability
 - Identifying tradeoffs of power flow control solutions

The following transmission power flow control solutions will be evaluated:

- Series capacitors and inductors for changing line impedance (thyristor controlled or discretely switchable)
- Phase-shifting transformers (traditional and rotary)
- Flexible AC transmission devices (FACTS)
- Georgia Institute of Technology's Smart Wire Grid (new technology)
- Subgrid sectionalizing schemes
- Other promising flow-control solutions that may be added as the project progresses.

Why It Matters

- The best outcome would be identification of a power flow solution that replaces a new line build at a fraction of the cost. This could result in millions to tens of millions of dollars in capital savings.
- A documented effort that demonstrates to the region BPA's consideration of all alternatives before building a new main grid line is a valuable product.
- The internal knowledge gained on modern control flow devices, their potential application to the BPA system, and possible enhancements to the study software tools will have long-term benefits for maintaining a Transmission Planning staff ready to address the challenges faced in meeting the transmission demands in the region.
- With the studies being performed by BPA engineers, an increased knowledge of the BPA system and power flow transmission solutions will be attained.

Goals and Objectives

The project objective is to study transmission-level power flow control solutions for applications to BPA's transmission system. The optimal goal is to provide a list of projects that have tested results and are available for Transmission Planning to move into the Planning Process, as is determined to be appropriate.

- Properly selected, located, and coordinated power flow control applications can result in significant increases in path operational transmission capability (OTC) and total transmission capability (TTC).
- The power flow control applications might be a fraction of the cost (1/2 or less) of building new transmission lines through populated load centers. These solutions may result in the delay or possible replacement of new line projects. This would provide a significant value to the ratepayers/stakeholders.
- Increasing the control of power flow on the grid is expected to allow for a more optimized use of the existing assets and improved flexibility for outages.

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Project Start Date: October 1, 2012

Project End Date: June 30, 2014

Reports & References (Optional)

Links (Optional)

Participating Organizations

BPA-Technology Innovation
BPA-Transmission Planning

Funding

Total Project Cost:	\$75,000
BPA Share:	\$75,000
External Share:	\$0
BPA FY2013 Budget:	\$50,000

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